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COMPLETE SPECIFICATION

Improvements in or relaitng to Potato Products

We FRITO-LAY, INC., a corporation organised under the laws of the State of Texas, of Exchange Bank Building, Dallas, Texas, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a potato product, and particularly to a deep fat fried potato product, which is of a completely homogeneous nature. This invention also relates to a process for making such products.

There are a great many disadvantages inherent in the methods presently employed in the processing of potatoes in the formation of commercial products such as potato chips. Many of these problems relate to the raw potato from which the product is made.

At the present time, potatoes are commonly cured by storing at temperatures of from 10—24°C. for periods up to three months for the purpose of sugar removal. This requires extensive storage facilities in which the temperature and humidity must be carefully controlled. Potatoes so stored tend to sprout to a considerable extent. This sprouting results in great economic loss due to shrinkage and the necessity for removing the sprouts prior to processing.

In the production of potato chips according to conventional techniques, after the potatoes have been stored as previously described to lower the sugar level, they are peeled, sliced into chips and washed prior to frying. Considerable loss of solids occurs during the slicing and washing operation due to the extremely large surface area of the chips. Commonly, this loss amounts to about 11% of the total solids.

It is well known that natural potatoes vary greatly in their composition, such as sugar content, solids content, flavor, etc. The extent of these variations are influenced by many factors such as the type of potatoes, the season when harvested, the area where grown, their culture during the growing season, the length of time they are stored prior to use, etc. These variations result in non-uniformity of products made from the potatoes. For example, it is known that the rate of browning of a potato product during processing such as deep fat frying is influenced by the reducing sugar content of the potato. Therefore, potato chips made from one potato may be much darker in color than those made from another potato due to the difference in reducing sugar content between the different potatoes. This correlation between the reducing sugar content of a potato and the extent of browning of chips made from the potato imposes a serious limitation on the selection of potatoes which may be used in chip manufacture. It has been reported in the literature that in most instances, acceptably colored chips may be made from potatoes of less than 0.2 per cent reducing sugars; but that chips made from potatoes containing more than 0.25 per cent reducing sugar generally are too dark to be commercially acceptable.

Furthermore, the oil absorption rate of a potato product varies with the solids content of the potato. Generally, it has been found that for every 1% by weight decrease in solids content of the raw potato, the amount by weight of oil which the potato product is capable of absorbing increases by about 1½%. For example, when the solids content is from 16 to 17% by weight, the amount of oil which the potato product will absorb will vary from approximately 40 to 38½% by weight. This results in potato chips made from different potatoes having markedly different oil contents due to variations in solids content of the potatoes.

Moreover, individual potatoes are not of

uniform composition. For example, each potato contains a layer, a fraction of a centimetre below the surface of the potato, which completely encloses the inner portion of the potato. This layer may be higher in reducing sugar content than any of the rest of the potato and the portion of the potato which is enclosed by this layer may be of a higher reducing sugar content than the portion of the potato lying immediately below the surface. Since the rate of browning on frying varies with the reducing sugar content, each potato chip may therefore have at least three distinct areas of different degrees of browning. Moreover, bruises result in localized areas of high reducing sugar concentrations. Consequently, bruised areas will generally result in unsightly dark spots on the chips when the chips are fried. Also, the inner portion of a natural potato has a lower solids than does the outer portion. Therefore a chip sliced from a natural raw potato will, when fried, have areas of varying oil content due to the different rates of oil absorption in the areas of varying solids content.

Attempts have been made to produce artificial potato products from potato flour, mashed potatoes or other farinaceous materials high in starch content. However, it has not heretofore been possible to achieve a proper balance of true potato flavor and texture in the resultant product which is necessary in an acceptable commercial product.

This invention provides potato products of a completely homogeneous nature.

This invention also eliminates the necessity for storing raw potatoes for long periods of time prior to processing. This invention further avoids the high losses of potato solids generally associated with potato chip production.

In addition this invention produces high quality potato chips from potatoes having a high reducing sugar content.

Furthermore, this invention produces from fresh, raw potatoes, which may be of widely divergent compositions and characteristics, deep fat fried potato products, such as potato chips, which are of uniform color, texture, flavor, solids content and oil content. Moreover, this invention provides a means for consistently producing potato chips having the same uniform characteristics.

According to one aspect of this invention, a potato product is produced by reducing the particle size of raw potatoes (which may have been previously peeled, sliced washed and treated with an inhibiting agent to prevent enzymatic browning) to form a mixture of finely divided solids and liquid, increasing the viscosity of the mixture, forming the mixture into shaped bodies, such as chips, and subsequently cooking the shaped bodies, for example by frying in deep fat.

Another aspect of this invention consists of a potato product obtained by a process as defined in the preceding paragraph.

In carrying this invention into effect, potatoes of different varieties, size and compositions may be used as starting materials. They are generally first peeled, sliced into smaller pieces, and washed by techniques well known to the art. The size of the pieces into which the potatoes are sliced is not critical but varies generally between 6.4 to 25 millimetres in diameter. The optimum size of these pieces will depend on the type of apparatus which will be used to reduce the particle size to form the mixture of finely divided solids in liquid. If the potato pieces are to be stored for any length of time at any point prior to the completion of the operation, or if subjected to a current of air during the grinding operation, they should be treated with a suitable inhibiting agent, such as by dipping them in a dilute solution of sodium bisulfite or sulfurous acid, to prevent enzymatic browning. Such treatment is wholly conventional and does not constitute a part of this invention.

The potato pieces are then subjected to a treatment which reduces the particle size of the potatoes. This treatment ruptures a portion of the starch cells in the potato and releases the liquid contained in the starch granules or Parenchyma cells. The amount of liquids released increases as the particle size decreases. A mixture of finely divided solids and liquid, or a pulp, is thereby formed. This mixture is composed of intact cells, ruptured cells, liberated starch granules and cell sap and has a viscosity of about 7 to 10×10^4 centipoises. The maximum particle size of the solids in the mixture should not be greater than that which may be accommodated during subsequent operations. For example, if the material is to be subsequently extruded to form potato chips, no particles should be of a larger diameter than the orifice through which they must be extruded—i.e., if the orifice is 0.89 millimetre thick, no particle should have a diameter greater than 0.89 millimetre. The particles may be either uniform or random in size.

Reduction of the particle size of the potatoes may be accomplished in any apparatus which will cut or shear the potatoes into fine particles. Crushing of the potatoes should be avoided since this results in the formation of a "stringy" pulp and adversely affects the flavor and texture of the final products. It is preferred to avoid high temperatures in the formation of the pulp since high temperatures may adversely affect the flavor characteristics of the product. A Fitzpatrick mill may be used to reduce the particle size of the potatoes. Particular good results have been obtained by the use of an Urschel cutting mill which reduces the par-

ticle size from about 0.25 to 0.5 millimetre in diameter.

In an Urschel cutting mill, the particle size of a product is reduced by the product being passed over sharp knife edges. An Urschel cutting mill has three cutting heads. Each head has the shape of a cylinder and the product is acted upon after entering an impeller which revolves closely within the stationary cylinder. As the impeller whirls the product against the inner surface of the cylinder, pieces are cut off and ejected through openings of determined size in the cylinder wall.

After the particle size of the potatoes has been reduced to form a mixture of finely divided solids and liquid, according to one embodiment of this invention, part of the liquid may be separated from the mixture, processed in a manner hereinafter described and subsequently returned to the solids phase. For example, from about 40 to 80%, by weight of the mixture of finely divided solids and liquid may be removed in the separation step. The separation of the liquid may be accomplished by means of a centrifuge, a screw press or by means of filtration. The liquid which is separated from the pulp contains a major portion of the reducing sugar and amino acids content which was originally present in the potatoes. The extent of removal of these constituents will depend upon the amount of liquid separated from the mixture of finely divided solids and liquid. By controlling the reducing sugar content of the solids phase, the extent of browning of the final product may also be controlled. Before the separated liquid is returned to the solids phase, it may first be treated to remove the reducing sugars and/or amino acids contained therein. Since heat browning does not occur unless both amino acids and reducing sugars are present, browning may be controlled by removal of a portion of either one or the other of these constituents. The reducing sugars content of the liquid may be removed by means of any of the standard methods which are known to remove sugar from liquids such as by fermentation, or enzymatic oxidation. The amino acids may be removed from the liquid by passing the liquid through a suitable ion exchange column.

Any liquid which is separated from the mixture of finely divided solids and liquid contains a substantial proportion of the coagulable protein content of the original potatoes. These proteins contain nutrient as well as flavor value. Therefore, it is frequently desirable to return them to the finely divided solids phase. If the separated liquid is not to be returned to the solids as such (i.e. if, for example, the amount of liquid removed is replaced by the addition of water to the solids phase) then the proteins may be recovered from the liquid such as by heat coagulation and returned to the solids phase. Thus, if the liquid is heated to a temperature between 63° and 74° C., or if the liquid is flashed at a higher temperature for a short period of time, the proteins will coagulate and precipitate. They may then be recovered by filtration and returned to the finely divided solids.

In any event, if a portion of the liquid is removed from the pulp according to this embodiment of the invention, sufficient liquid should be returned so that the composition will have approximately the same solids content as the original pulp. It should be emphasized that any removal of liquid from the raw pulp is optional and is not essential to the practice of this embodiment of the invention.

The mixture of finely divided solids and liquid obtained in this embodiment is heated to gelatinize at least 80% by weight of the indigenous starch—i.e., the negative starch contained in the potatoes. The heat gelatinization of the potato pulp may be accomplished in any suitable heat exchanger such as, for example, a "Radar" (Trade Mark) range. It is preferred to utilize a scraped surface heat exchanger (i.e., one which provides means for continuously scraping the potato pulp from the surface of the heat exchanger during operation) and to mix the potato pulp during the heating operation.

The potato pulp should be heated to a temperature of from about 65 to 100° C. in order to gelatinize the starch. The duration of the heating operation will depend upon the length of time required to gelatinize at least 80% of the starch. The gelatinization of the starch increases the viscosity of the pulp to form about 2 to 6×10^5 centipoises.

After at least 80% of the starch in the pulp has gelatinized, it is preferred to cool the pulp in order to further increase its viscosity to from about 1 to 20×10^6 centipoises. Cooling may be accomplished in any suitable apparatus, such as a scraped surface heat exchanger, or simply by allowing it to stand at room temperature or by storing it in a cool room. The particular manner by which the cooling is effected is not critical. It is preferred that the temperature of the pulp be lowered to between from about 4 to 21° C. Cooling the pulp eliminates some of its cohesiveness and renders the pulp easier to process in subsequent operations.

According to this embodiment of the invention, other ingredients may be admixed wilth the potato pulp, either before or after the indigenous starch is gelled, which do not adversely affect the nature, such as the flavor and texture, of the final product. Such ingredients include salt, barbecue seasoning and other seasoning agents. However, nothing

should be added which will interfere with or mask the potato flavor in the final product.

The potato pulp is next formed into shaped bodies by any suitable means. For example, the pulp may be rolled into a sheet and cut into pieces of the desired shape. Alternatively, the desired potato products may be formed by extruding shaped bodies. In a preferred embodiment of this invention, the pulp is extruded through a variable orifice extrusion die to form round or oval shaped chips.

Another means by which shaped bodies may be formed from the pulp is by rapidly cooling the pulp almost to its freezing point (about −2° C.) and slicing the mass into pieces of the desired shape and size. During cooling, the pulp passes through a semi-solid state before freezing solid. At this point, it may be easily sliced with a sharp knife.

After forming, the shaped bodies may be dusted with a starchy or farinaceous material to reduce their cohesiveness.

The shaped bodies formed according to this embodiment of the invention are composed of about 4/5 moisture. Before frying, it is necessary to dry the shaped bodies in order to bring their solids content to from 50 to 95%, and preferably from about 75 to 90% by weight. The drying step is essential to this embodiment in order to achieve proper textural characteristics in the final product. The shaped bodies may be dried at ambient temperatures or by heating up to 149° C. for a short time in an oven. During the drying operation, the shaped bodies shrink to about 1/2 their original size. The dried bodies are hard and translucent. They are then fried in deep fat at a temperature of from 149 to 204° C. for from about 5 to 15 seconds.

Any conventional apparatus which is ordinarily used for deep fat frying may be employed to cook the potato products of this invention. The frying may be accomplished by means of a batch operation, in which a batch of shaped potato bodies are charged directly into the cooker, agitated and then removed; or by means of a continuous frying process, in which the dried potato bodies, such as chips, are fed into one end of a cooker and are continuously removed from the other end.

The type and temperature of fat or oil used to cook the chips are those conventionally used in deep fat frying potato chips. There may be used, for example, cottonseed oil, peanut oil, corn oil, soybean oil, mixtures of any of these, or coconut oil. The temperature in the cooker generally varies between about 160° C. and 191° C.

During the frying operation, the moisture content of the shaped bodies is reduced to below about 10% by weight. The shaped bodies absorb up to 50% by weight of oil and expand about 300% in thickness and area. The resultant products have a friable honeycomb type of texture. The products are characterized by uniformity of color, flavor, texture, oil content, size, both within each individual chip and between all of the chips. The products of this invention are crisp and have an elegant flavor.

By the practice of this embodiment of the invention, fat fried potato products, such as chips, can be made from potatoes which contain a much higher amount of sugar than has been previously possible. Thus, the pulp from which the chips are formed may be prepared from potatoes which have a reducing sugar content in excess of 1% by weight which is about ten times the normal limit.

According to a closely related embodiment of this invention, the moisture content of the raw potatoes may be reduced to as low as about 55% by weight prior to heating to gelatinize the starch. This embodiment results in the formation of a pulp of increased viscosity and permits the pulp to be formed into shaped bodies at higher temperatures after gelatinization of the starch.

The following examples illustrate the foregoing described embodiments of this invention.

EXAMPLE 1

Raw potatoes (2.3 kilograms), having a moisture content of approximately 80 per cent by weight, are washed, trimmed, sliced into discs of about 6.4 millimetre thickness, treated with a 0.3% by weight aqueous sodium bisulfite solution, and put through a high speed cutting mill. A mixture of finely divided solids in liquid is formed having a viscosity of 7×10^4 centipoises. This pulp is heated for 5 minutes in a scraped surface heat exchanger to a temperature of 93° C. to gel at least 80% of the starch in the pulp. The heated pulp, which has a viscosity of 2×10^5 centipoises, is then cooled to 10° C. The cooled pulp, having a viscosity of 2×10^6 centipoises, is extruded through an extrusion orifice of varying width and a thickness of 0.76 millimetre into 50×75 millimetre elliptical-shaped chips. These chips are heated in a hot air oven having a perpendicular air flow of 152 metres per minute at 93 to 149° C. and a relative humidity of 6% for 30 minutes. The resulting dried chips, which contain 15% by weight of moisture and 85% by weight solids, are hard and translucent and are about 1/2 their original size. The chips are then fried by submerging them for 5 seconds in fat at 193° C. and immediately removed. The resulting chips, which have expanded in size about 300%, contain 30% by weight of fat and 5% by weight of moisture. They possess a crisp, friable texture, a golden color and have a good potato chip flavor.

EXAMPLE 2

To 2.3 kilograms of raw potato pulp prepared as in Example 1, there are added and admixed therewith 42.5 grams of commercial barbecue seasoning. The pulp is then processed as described in Example 1 to form chips containing 30% by weight of oil and 4% by weight of moisture. The resultant chips possess a crisp, friable texture, were reddish-brown in color and have a good barbecued potato chip flavor.

EXAMPLE 3

Potatoes (1000 parts by weight), of varying sizes and grades and of the cobbler variety, are peeled, sliced into pieces about 6.4 millimetres × 6.4 millimetres × 25 millimetres, washed, treated with a 0.3% by weight aqueous sodium metabisulfite solution, and put through an Urschel rotary cutting mill. The blades on the head of the mill are spaced about 0.5 millimetre apart and the impeller is rotated at a speed of about 7200 RPM. A mixture of finely divided solids in liquid is formed. The maximum particle size of the solids in the mixture is 0.5 millimetre in diameter. The mixture is heated with mixing to 82° C. for a time sufficient to gel at least 80% of the starch in the mixture. The mixture is then chilled to −1° C. at which temperature it is in a semi-solid state. Chips are sliced from the chilled mixture with a sharp knife and are given a surface application of flour. The chips are then air dried at ambient temperature to a moisture content of about 25%. They are then submerged in fat at 193° C. for 5 seconds. The resultant chips are of a uniform light golden color and have a uniform oil content.

EXAMPLE 4

The process of Example 1 is repeated except that 55% by weight of the mixture of finely divided solids and liquid is removed as liquid from the raw pulp by centrifuging and the liquid is recovered. The liquid is run through a vertical ion exchange column containing an anion exchange resin ("Amberlite"—Trade Mark—IRH-400, quaternized chloromethylated polystyrene) to remove the amino acid content of the liquid. The effluent from the column is returned to the finely divided solids phase. The pulp is then processed as described in Example 1. The resultant chips were very light in color.

EXAMPLE 5

Raw potatoes (2.3 kilograms), having a moisture content of approximately 80 per cent by weight, are washed, trimmed, sliced into discs of about 3.2 millimetre thickness, steeped for 30 minutes in a 0.3% by weight aqueous sodium bisulfite solution, drained to remove excess moisture and dried for about one hour at about 38° C. to a moisture content of about 60% by weight. The slices are then put through a high speed Urschel cutting mill on which the blades on the head of the mill are spaced about 0.5 millimetre apart. The resultant pulp is heated for 5 minutes in a scraped surface heat exchanger to a temperature of 93° C. to gel at least 80% of the starch in the pulp. The heated pulp, is then cooled to 38° C. and is extruded through an extrusion orifice of varying width and a thickness of 0.76 millimetre into 50 × 75 millimetre elliptical-shaped chips. These chips are heated in a hot air oven having a perpendicular air flow of 152 metres per minute at 93 to 149° C. and a relative humidity of 6% for 30 minutes. The resulting dried chips contain 15% by weight of moisture and 85% by weight solids. The chips are then fried by submerging them for 5 seconds in fat at 193° C. and immediately removed. The resulting chips, contain 29% by weight of fat and 4% by weight of moisture, possess a crisp friable texture, a golden color and have a good potato flavor.

According to another embodiment of this invention, the viscosity of the raw potato pulp obtained by reducing the particle size of raw potatoes as previously described, is increased by separating part of the liquid from the mixture and adding a gelling agent to the solids portion. Generally, from about 40 to 80%, and preferably from about 47 to 53%, by weight of the mixture of finely divided solids and liquid is removed in the separation step as liquid. In a preferred embodiment of this invention, about 50% by weight of the puree is removed as liquid. The separation of the liquid may be accomplished by means of a centrifuge, a screw press or by means of filtration. Considerable savings can be made in transportation costs if this portion of the process is performed at or near the growing location of the potatoes. Only the finely divided solids phase need then be shipped to the manufacturer of the final product.

The liquid which is separated from the pulp may be treated as previously described to remove reducing sugars and/or amino acids to control the extent of browning of the final product; and to recover the protein content therefrom.

By controlling the amount of liquid removed from the mixture of finely divided solids and liquid, the solids content of the finely divided solids phase and, therefore, the oil absorption of the final product is also regulated. After separation of the liquid, if the solids content of the finely divided solid phase is still too low, it may be increased by the addition of a small amount of dehydrated potatoes. Conversely, if the solids content is too high, it may be lowered by the addition of liquid such as a portion of the liquid previously removed. Moreover, dif-

ferent batches of finely divided solids having different solids content may be combined. The finely divided solids phase may have a solids content as low as about 30% or as high as about 90% prior to admixing it with a gelling agent and forming it into shaped bodies. It is preferred that the finely divided solids phase have a solids content of 36 to 42% by weight at this stage of the operation.

Various additives are mixed with the finely divided solids phase before it is formed into shaped bodies and fried. It is preferred to add a gelling or stiffening agent to the solids such as cellulose derivative (e.g., methyl cellulose and carboxymethyl cellulose), starches (either cold gelling or hot gelling), agar, or other ingestible colloidal materials. A mixture of gelling agents may be, and generally is, used. The addition of a gelling agent to the finely divided solids imparts to the mixture the proper consistency, elasticity and viscosity to facilitate subsequent processing such as sheeting or extruding. Methyl cellulose is particularly desirable since it makes the final products more tender. The total amount of gelling agents added should generally not exceed 10% by weight of the finely divided solids phase.

Other constituents may also be added to improve the flavor, color or other properties of the final product. Among the optional ingredients which may be included there may be mentioned gluten, soy flour, lecithin, fats, sugars, monosodium glutamate, hydrolized vegetable protein and other spices, seasonings and flavorings.

The particular method of mixing the additives with the finely divided solids phase is not critical. For ease of mixing however, it is preferred to premix all of the additives and then add the premixed additives to the finely divided solids phase.

The finely divided solids phase in admixture with a gelling agent is formed into shaped bodies by any suitable means such as described previously. In a preferred embodiment of this embodiment of the invention, a mixture of finely divided solids phase, gelling agent and other additives is extruded through a variable orifice extrusion die to form round or oval shaped chips which are dropped directly into a continuous frying machine.

Any conventional apparatus which is ordinarily used for deep fat frying may be employed to cook the potato products of this invention. The frying may be accomplished by means of a batch operation, in which a batch of shaped potato bodies are charged directly into the cooker, agitated and then removed. For most efficient operation, however, a continuous frying method is preferred. In a continuous frying process, the potato bodies, such as chips, are fed into one end of a cooker and are continuously removed from the other end.

The type and temperature of fat or oil used to cook the chips are those conventionally used in deep fat frying potato chips as previously described.

Products obtained in accordance with the practice of this embodiment of the invention, such as potato chips, are characterized by reasonable uniformity of color, flavor, texture, oil content, size, both within each individual chip and between all of the chips. Moreover, potato chips made in accordance with this invention are more rigid than and do not break as easily as chips made by conventional processes and, therefore, are more satisfactory for use with creamed dips. The products of this invention are also denser, retain their crispness well, are less porous and have firmer texture than potato products which are presently known. The products of this invention also have an elegant flavor.

The following examples illustrate the foregoing described embodiment of this invention.

EXAMPLE 6

Potatoes (1000 parts by weight), of varying sizes and grades and of the cobbler variety, were peeled, sliced into pieces about 6.4 millimetres × 6.4 millimetres × 25 millimetres, washed, treated with a 0.3% by weight aqueous sodium metabisulfite solution, and put through an Urschel rotary cutting mill. The blades on the head of the mill were spaced about 0.5 millimetre apart and the impeller was rotated at a speed of about 7200 RPM. A mixture of finely divided solids in liquid was formed. The maximum particle size of the solids in the mixture was 0.5 millimetre in diameter. About 50% by weight of the mixture was removed as liquid in a centrifuge. The remaining finely divided solids phase was a white, soft material which still contained a substantial amount of water. However, it would not hold together when stretched or rolled and was unsuitable for extrusion. It possessed low elasticity. A premix, consisting of 25 parts by weight of pregelatinized wheat starch, 5 parts by weight of waxy maize starch, 3 parts by weight of methyl cellulose (viscosity of 15,000 centipoises; gels at 90° C.), one part by weight of reducing sugar, and one part by weight of monosodium glutamate, was added to 500 parts by weight of the finely divided solids phase and the composition was mixed at slow speed for 2½ minutes in a large "Hobart" (Trade Mark) mixer. The resultant mixture was stiffer, more elastic and held together better than did the finely divided solids phase. The mixture was given a surface application of oil and was charged to the hopper of a pump extruder which was equipped with a die having an extrusion orifice of varying width and a thickness of 0.89

millimetre. The mixture was extruded as round chips directly into moving oil in a continuous cooker. The oil in the cooker was held at a temperature of about 166° C. and the residence time of each chip in the cooker was about 3 minutes. An application of salt was put on the chips as they were removed from the cooker. All of the chips were of a uniform light golden brown color and had a uniform oil content. They were very tender, possessed a delectable flavor, and retained their crispness for a long period of time.

EXAMPLE 7

The process of Example 6 was repeated except that 60% by weight of the mixture of finely divided solids and liquid was removed as liquid. The separated liquid was heated to about 71° C. to coagulate the protein and other coagulable material which was then recovered by filtration and added back to the finely divided solids phase. The finely divided solids phase was then processed as described in Example 6. The resultant chips possessed excellent color and flavor.

EXAMPLE 8

The process of Example 6 was repeated except that 65% by weight of the mixture of finely divided solids and liquid was removed as liquid. The separated liquid was recovered and 0.025% by weight of glucose-oxidase buffered to pH 7.7 was added thereto. The mixture was allowed to stand at room temperature until the reducing-sugar content of the liquid had been decreased 2½ fold. Sufficient treated liquid was then added back to the finely divided solids phase to give a solids content of about 36% by weight. The solids phase was then processed as described in Example 6. The resultant chips possessed excellent color and flavor.

EXAMPLE 9

The process of Example 6 was repeated except that 55% by weight of the mixture of finely divided solids and liquid was removed as liquid and the liquid was recovered. The liquid was run through a vertical ion exchange column containing an anion exchange resin (Amberlite IRH-400, quaternized chloromethylated polystyrene) to remove the amino acid content of the liquid. Sufficient effluent from the column was returned to the finely divided solids phase to give a solids content of 42%. The solids phase was then processed as described in Example 6. The resultant chips were very light in color.

EXAMPLE 10

Freshly cut Kennebec potatoes (500 parts by weight), having a sugar content of about 0.15% by weight, were peeled, sliced into pieces of about 6.4 millimetres × 6.4 millimeters × 25 millimetres, washed, treated with 0.3% by weight aqueous solution of sodium metabisulfite, and put through an Urschel rotary cutting mill. The width of the slits in the head was about 0.5 millimetre and the impeller was rotated at a speed of about 7200 RPM. To the puree which was thereby formed there was added a premix of 50 parts by weight of pregelatinized wheat starch, 10 parts by weight of waxy maize starch, 6 parts by weight of methyl cellulose, 2 parts by weight of reducing sugar and 2 parts by weight of monosodium glutamate. The composition was mixed in a large Hobart mixer for about 3 minutes. It was then extruded through a variable orifice extrusion die having a slit width of about 1 millimetre as a round chip into a cooker. The oil in the cooker was held at a temperature of about 171° C. and the residence time of each chip in the cooker was about 2½ minutes. All of the chips were completely homogeneous in color, flavor and texture.

WHAT WE CLAIM IS:—

1. A process for producing a potato product characterized by reducing the particle size of raw potatoes to form a mixture of finely divided solids and liquid, increasing the viscosity of said mixture, forming said mixture into shaped bodies and subsequently cooking said shaped bodies.

2. A process according to claim 1 characterized in that the viscosity of said mixture of finely divided solids and liquid is increased by heating said mixture to gelatinize at least 80% by weight of the starch in said mixture and said shaped bodies are dried to bring their solids content to from 50 to 95% by weight prior to cooking.

3. A process according to claim 2 characterized in that the moisture content of the raw potatoes is reduced to as low as about 55% prior to heating to gelatinize the starch.

4. A process according to claim 1 or 2 characterized in that the viscosity of said mixture of finely divided solids and liquid is increased by heating said mixture to a temperature of from about 65 to 100° C. and said shaped bodies are dried to bring their solids content to from 75 to 90% by weight, said solids consisting essentially of potato solids.

5. A process according to claim 4 characterized in that said heated mixture is then cooled to a temperature of from about −1 to 38° C.

6. A process according to claim 5 characterized in that said mixture is cooled to a temperature of from about 4 to 21° C. prior to forming into shaped bodies.

7. A process according to claim 4, 5 or 6 characterized in that said shaped bodies are dusted with a farinaceous material prior to drying.

8. A process according to claim 1 characterized in that the viscosity of said mixture of finely divided solids and liquid is increased by separating at least a portion of the liquid from said mixture, and forming an admixture of said finely divided solids and a gelling agent.

9. A process according to claim 8 characterized in that from about 40 to 80% by weight of said mixture of finely divided solids and liquid is removed as liquid.

10. A process according to claim 8 or 9 characterized in that at least a portion of said gelling agent is methyl cellulose.

11. A process according to claim 8, 9 or 10 characterized in that at least one flavoring agent and at least one seasoning agent are added to said admixture.

12. A process according to any one of the preceding claims characterized in that said bodies are fried in deep fat.

13. A potato product obtained by the process of any one of claims 1—12.

14. A crisp, friable potato chip obtained by reducing the particle size of raw potatoes to form a pulp, heating said pulp to a temperature of from about 65 to 100° C. to gelatinize at least 80% by weight of the starch, forming said pulp into chips, drying said chips to bring their solids content to from 75 to 90% by weight, and subsequently frying said dried chips in deep fat, said fried chips containing up to 10% by weight of moisture, up to 50% by weight of fat, the remainder being solids, said solids consisting essentially of potato solids.

15. A process for producing a potato product as herein described.

16. A potato product as herein described.

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